

The direction of planetary environment sciences: Current and future activities of observational and modeling studies

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Study of planetary environment aims the comparative and systematic understanding of PLANETARY ATMOSPHERE, covering from terrestrial planets and satellites (Earth, Mars, Venus, Mercury, Europa/Ganymede, Enceladus/Titan, ...), outer planets (Jupiter, Saturn, ...), interplanetary space, to exoplanets.

All planets have their ATMOSPHERE. Here, the word ATMOSPHERE covers all altitude range from tropospheres, stratospheres, mesospheres, thermospheres, exospheres, to magnetospheres, which are physically and chemically connected to the planets. In lower altitude, neutral is major component, and affected by the phenomena occurred at the planetary surface and interior. In upper altitude, plasma is major, connecting to sun and interplanetary space and affected by them. Planetary gravity, temperature, history, sea/crustal activity, etc. produce different atmospheres. The various physics and chemical processes decide the planetary environment. It is like 'the major terrestrial environment problems are our atmospheric issues.'

Our studies are systematically promoted by the pioneering tool and method. The former includes new instruments and own groundbased facilities. The latter covers state of art numerical codes and analytical tools. Based on these activities, we can realize new space missions by JAXA and contribute to world-wide planetary explorations by other space agencies. It is the basis of long-standing research and education capabilities of our field with active international collaborations.

In last Feb, JAXA requested space science communities to submit the future target, strategy, and process document. Related to the planetary environment sciences, two visions are shown: One is Solar-Terrestrial-Planetary Environment Field (from Upper atmospheric science group of Society of Geomagnetism and Earth, Planetary and Space Sciences [SGEPSS]). The other is Planetary and Solar System Field (from Japanese Society of Planetary Sciences). Both documents are based on their recent long-term vision formed by long discussions, and include the reality of JAXA space missions in next two decades. It is the first version, and expected the revisions year by year.

This paper will discuss the parts related to the planetary environment sciences involved in both visions, and also involve the possible directions of ground-based and modeling activities. It is not realistic that our domestic community can cover whole related fields by our resources and limited launch and human resource capabilities. We need to find 'a better way' (it might not be the best, but), to enhance the strong core points and to enlarge the wings to wider fields. It means a kind of 'selection and concentration', but we should create the ambitious ships which can convey larger number of multi-field scientists and enhance the interaction between them. We try to draw an additional line for the discussion in the community.